Project Title: Aquatic Plant Monitoring Project
Reporting Period: October 1st, 2017 – March 31st, 2018
Grant Number: I00E27406
Report Prepared By: Mikulyuk   **Date Report Submitted: 4/30/18**

PROJECT SUMMARY:

We conducted 48 aquatic macrophyte point-intercept surveys on a representative sample of Wisconsin waterbodies. With this dataset, we may determine macrophyte community associations occurring across a range of lake sizes as well as evaluate lake ecological condition. Results from this analysis will provide a dataset we may use to report on waterbody health, characterize macrophyte community types, quantify environmental associations and describe species distributions and abundance statewide.

PROJECT OBJECTIVES AND TASKS:

1. Create representative dataset of Wisconsin macrophyte communities by conducting point-intercept surveys following a probabilistic survey design
2. Taxonomic verification and taxonomic certainty assessment following QAQC protocol
3. Use macrophyte-based biocritera to evaluate ecological condition of Wisconsin waterbodies for general impairment and impairment due to phosphorus.
4. Prepare final report describing macrophyte community patterns and lake ecological condition

PROJECT ACCOMPLISHMENTS AND PROGRESS:

During the current reporting period, we accomplished tasks related to data management and analysis. We processed data on the 47 lakes sampled for aquatic macrophytes during the previous reporting period. We cleaned and screened the data for errors and omissions and added all information to the central database.

We completed preliminary data analysis. Summary statistics were calculated for each survey and include estimates of aquatic macrophyte species richness, maximum depth of plant colonization, lake percent littoral area, percent littoral area vegetated. We also calculated the Floristic Quality Index [1] with modifications to include invasive species and other updates to conservatism value estimates following [2]. We assessed the ecological condition related to general measures of anthropogenic disturbance and total phosphorus according to the procedure outlined in [3].

We produced statistical summaries for the state of Wisconsin following the probabilistic design up-scaling procedure using the stratum weights provided by EPA. We summarize our findings for plant community statistics in Table 1 and ecological condition categories in Table 2.

Table 1. Aquatic macrophyte community characteristics based on 46 surveys up-scaled to describe the population of lakes in Wisconsin.

Metric	Range	Description	% of Lakes
Floristic Quality Index	0-10	Low	14.5
	11-20	Medium	28.9
	20-28	High	43.1
	>28	Very high	13.5
Maximum Depth of Colonization	10ft	Shallow	44.1
	15ft	Moderate	20.7
	22 ft	Deep	8.4
	40ft	Very deep	26.8
% Littoral	0-33	Limited	15.9
	34-69	Moderate	28.8
	70-100	Extensive	55.3
% Littoral Vegetated	0-20	Very patchy	12.9
	20-40	Patchy	9.7
	40-60	About half	24.7
	60-90	Mostly	33.6
	90-100	Entirely	19.2
Richness	6-10	Low richness	23.6
	11-20	Species-rich	33.9
	>20	Very rich	13.5
	≤ 5	Species-poor	29.0

Table 2. Lake ecological condition using 46 surveys up-scaled to describe the population of lakes in Wisconsin.

Ecological condition	Condition category	% of Lakes
General stress	Excellent	38
	Good	30
	Poor	21
	Not assessed	11
Nutrient enrichment	Excellent	47
	Good	9
	Poor	33
	Not assessed	11

ACTVITIES PLANNED:

We plan to continue data analysis, pairing data from the aquatic macrophyte surveys with water chemistry, watershed characteristics, and physical/morphometric variables to better understand patterns in macrophyte community composition, species abundance and biodiversity. Additionally, we will use the information collected under the 2017 NLA to create an aquatic plant community categorization. Using multivariate clustering techniques, we will describe aquatic plant 'community types' to lay the groundwork for outreach, communication, and understanding the habitat value of different aquatic plant communities. We will prepare a final report to EPA summarizing our efforts and findings.

PROBLEMS AND ISSUES: NONE

1. Nichols S, Weber S, Shaw B (2000) A Proposed Aquatic Plant Community Biotic Index for Wisconsin Lakes. Environmental Management 26: 491-502.
2. Radomski P, Perleberg D (2012) Application of a versatile aquatic macrophyte integrity index for Minnesota lakes. Ecological Indicators 20: 252-268.
3. Mikulyuk A, Barton M, Hauxwell J, Hein C, Kujawa E, et al. (2017) A macrophyte bioassessment approach linking taxon-specific tolerance and abundance in north temperate lakes. Journal of Environmental Management 199: 172-180.